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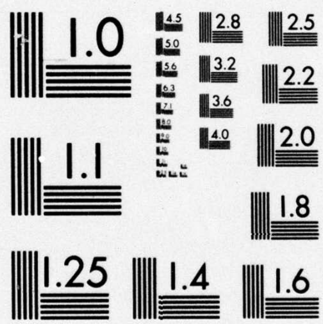
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THE NAVY AND REDUCED
SHIPBOARD MANNING
STUDY REPORT
PMC 73-2

Richard A. Gaites
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DEFENSE SYSTEMS MANAGEMENT SCHOOL

STUDY TITLE:

The Navy And Reduced Shipboard Manning

STUDY PROBLEM/QUESTION:

Examine the Navy's reduced shipboard manning programs in light of merchant marine experiences.

STUDY REPORT ABSTRACT:

The report summarizes some comments from the merchant fleets based on over ten years of experience with highly automated ships and small crews. Discussion centers on design, construction, maintenance, support and social problems. Future trends are also identified.

The U.S. Navy's recent experiences, as well as short and long range programs, are presented.

The report concludes that present Navy efforts are aimed at demonstrating the feasibility of ship automation and crew reduction, whereas these concepts have been proven in the commercial world.

A skeleton program is presented to float a demonstration ship before 1980.

KEY WORDS: PERSONNEL REQUIREMENTS SHIPBOARD MANPOWER CONTROL COST REDUCTION MATERIEL DESIGN AND DEVELOPMENT AUTOMATED SHIPS DESTROYERS LIFE CYCLE COST

Student, Rank Service	Class	Date
Richard A. Gaites DNC GS-13	PMC 73-2	November 1973

THE NAVY AND REDUCED

SHIPBOARD MANNING

STUDY REPORT

Presented to the Faculty

of the

Defense Systems Management School

in Partial Fulfillment of the

Program Management Course

Class 73-2

by

Richard A. Gaites
GS-13 DNC

November 1973

THE NAVY AND REDUCED

SHIPBOARD MANNING

An Executive Summary
of a
Study Report
by

Richard A. Gaites
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November 1973

Defense Systems Management School
Program Management Course
Class 73-2
Fort Belvoir, Virginia 22060

EXECUTIVE SUMMARY

It has been estimated that manpower costs consume 55% of the life cycle costs of a ship, and that by 1975 these costs will be 65% of the Navy's budget. Manpower reduction has become a necessity, if the procurement dollar is to survive. The CNO has directed that efforts to reduce ship manning be given priority and has appointed an OPNAV Coordinator for Shipboard Manning Reduction.

Merchant shipping has been operating automated ships with reduced crews for over ten years. It is not uncommon to find unmanned engine rooms and 2-3 man bridge watches. Crews may work one shift per day with weekends and holidays off.

This paper presents some of the comments of merchant shipbuilders/shipowners relating their experiences in the following areas; design, construction, maintaining, supporting, training and social problems. It, also, presents future trends, in most of these areas, within Europe, Japan and the United States.

The paper goes on to summarize recent efforts in the U.S. Navy carried out by a Joint Fleet/Lab-

oratory Team and 16 Fleet units. It, also, discusses the Navy's short and long range programs in this area. The main thrust of the short range program will be to automate the engineroom and integrate the bridge of a DE 1052 Class ship. Long range efforts will culminate in a 12 man destroyer-type ship by the late 1980's.

The paper concludes that construction costs of a highly automated ship will certainly be greater than those for presently configured ships and that the procurement dollar may not be alive when the Navy is ready to spend it. The point is made that such a ship could be constructed today, with the aid of our NATO allies, using off-the-shelf technology, since more than ten years of experience already exists. A bare-bones plan is presented for the development of a demonstration ship and a pilot support system. It is argued that such a program would be an efficient vehicle for the accumulation of much experience and that it would exhibit to the Congress the Navy's resolve to substantially reduce costs.

ACKNOWLEDGEMENTS

I would like to express my appreciation to Messrs. Bloomquist and Edmonds, Naval Ship Research and Development Center, Code 2792, for introducing me to the subject of reduced manning. I would, also, like to thank Dr. Theodore Williams, Purdue Laboratory for Applied Industrial Control, for his help when I was searching for literature pertaining to the experiences within the merchant fleets.

CONTENTS

INTRODUCTION

It is generally accepted that manpower costs are rising at an accelerated rate in the uniformed services. In the Navy, official BUPERS personnel life cycle costs for 1972 show that a BM3 costs \$11,256/year, and an 1100 LTCDR (SURFACE LINE OFFICER) requires \$33,070/year[1]. In addition, it costs approximately \$15,000 to design and build one man's bunk. It is also, estimated that manpower costs constitute 55% of the total life cycle costs of a ship[2].

These statistics take on alarming import when they are injected into a discussion of the future of the Defense budget. Here, again, top DOD policymakers are forecasting a budget of constant buying power for many years to come. In 1975, manpower costs, including pay and benefits, are expected to represent 65% of the Navy's budget[3]. It is obvious that the procurement dollar is being caught between the budget ceiling and the rising costs of manpower. It is, also, clear that reductions of a few percentage points in the manpower portion of the budget would free a large amount

1- Superscripts refer to references listed in the Bibliography

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ABSTAINER

This study represents the views, conclusions and recommendations of the author and does not necessarily reflect the official opinion of the Defense Systems Management School nor the Department of Defense.

of money to buy hardware, and that it is hardware which has a crucial impact upon the international balance of power.

The following is excerpted from CNO Action Sheet No. 303 of 19 May 1972.

> "Experience in the PF (Patrol Frigate) program and attempts to reduce PF manning have disclosed several ongoing or planned R&D efforts which affect shipboard personnel manning.... it appears that there is no coordinated program.... The CNO has requested that a coordinated R&D program be developed which is oriented directly toward the reduction of personnel manning in all classes of ships.".

The CNO later directed that the last sentence be modified to include aircraft and shore installations[4].

The problems associated with reducing manpower aboard fighting ships are extremely complex. In fact, judging from the Navy's inexperience with the problem, it would be safe to say that a good number of the problems are unknown. Casual reading

of articles written about the subject in commercial shipbuilding journals uncovers the attitude that even after 10 years of experience with essentially manned ships problems are still surfacing and that cause and effect relationships among alternative solutions are, at best, vague.

It is the purpose of this narrative to assemble some of these problems and to examine the nature of current efforts aimed at their solution. First, we will look at commercial shipbuilding's experiences with highly automated ships, and then we will summarize the U.S. Navy's short and long-range programs. Hopefully, this effort will prove of some value to the people associated with the program offices who are tasked with the design and construction of tomorrow's fleet.

EXPERIENCES IN COMMERCIAL SHIPPING

The merchant fleets have been undergoing the process of automation since the late 1950's. It is only in the last five years or so that written accounts of the experiences, gained during the shakedown years, have emerged. Although much has been written in technical journals concerning the aspects of automation in modern ships, it is not the intent of this article to deal in such details. Rather, the purpose here is to summarize the comments of technical managers from the commercial world for the consumption of technical managers in the Navy Department.

Elimination of that portion of the literature which dealt with technical design of shipboard control systems, unfortunately resulted in a dearth of relevant material. It was not until I reached the sympathetic ear of Dr. Theodore Williams of the University of Purdue Laboratory for Applied Industrial Control that my research bore fruit. He provided me with a copy of his first quarterly report on a study contract with the Naval Ship Systems Command[5], as well as leads to several trade

magazines. Since I will refer to Dr. Williams' report in ensuing paragraphs it would seem appropriate to briefly summarize some of his work at this time.

The portion of the report which will be referenced later is concerned only with the observations made by Dr. Williams and Mr. Kern, a companion researcher, during a three week cruise aboard the T/T SEA SERPENT of Salen Lines of Stockholm, Sweden on 18 May -7 June 1973. The SEA SERPENT off-loaded its cargo of crude oil in Trinidad and sailed to Cape Town during this period. The 255,350-ton d.w. turbine tanker contained a process computer system which performed the functions of navigation, steering and remote control of the propulsion turbines. The ship can accommodate a complement of 44 officers and crew, however, it is abnormal for the crews to exceed 32.

Except for maneuvering in and out of port, the bridge was manned by a Watch Officer and an Able Seaman. The Captain and the bridge crew operated on a staggered schedule to cover all watches, but the rest of the complement observed a 5 day, half day Saturday, 8-5 workweek with Sundays and

holidays off. During non-working hours the engine room was unmanned and the on-duty engineering officer set the engine alarm to ring in his room. The control room was never manned except during alarms and alarm circuit testing operations. The engineering officers considered alarm circuit inspections and plant maintenance as their prime functions. The following estimates indicate how their time was spent:

CHIEF ENGINEER	
Supervising/Administrative	100%
1ST ENGINEER	
Supervising	90%
Routine Maintenance	10%
2ND ENGINEER	
Safety Circuits & Alarm Tests	50%
Administrative Record Keeping	50%
3RD ENGINEER	
Routine Maintenance	60%
Safety Circuits & Alarm Tests	40%
ELECTRICAL TECHNICIAN	
Routine Maintenance of Elec. Eq.	75%
Electrical Record Keeping	25%

During manuevering in and out of port, the bridge was controlled by the Captain, a watch officer, a helmsman and one man who stood alert watch. The engine was controlled by the computer.

Theodore and Kern recorded details of the ship, the computer system, the engine room system and discussed their observations from surveilling and interviewing members of the crew.

The remainder of this section will be subdivided into two main topics and each main topic will again be further subdivided. The first of the main topics will summarize some of the experiences of shipbuilders to date. The second main topic will deal with some thoughts for the future. Neither section will presume to be exhaustive in nature.

EXPERIENCES TO DATE

Design and Construction. The basic advice in this area is to refrain from the practice of designing the plant equipment first and the control systems later. Some shipbuilders feel that the best solution is to buy a complete control system from one supplier. J.S. Croudace, Superintendent Engineer for Frank C. Strick and Co. Ltd., London writes, "At present, we have interconnected equipment from different suppliers, and when problems arise - which is not uncommon - and a specialist attends to restore his piece of equipment to full working order he frequently finds the fault is caused by another malfunction occurring in someone else's circuitry - hence another specialist is needed."[6]

R.H. Chadburn, Shell International Marine, London[7] describes the two basic philosophies, exhibited by the industry, towards automation. The alarm system concept is the type which calls the repairman to correct the malfunction. The control system attempts to eliminate human intervention by taking corrective action. In support of the latter,

D.A. Eaton, Superintendent Engineer, Houlder Brothers and Co. Ltd., London , remarks, "....no system of patrols, however, efficient, could equal such an installation as the sprinkler system for fire detection and extinction....We are confident that the weakest link in the satisfactory operation of any plant is the human element."[8]

Predictably, since shipping is one of the last industries to be touched by automation, the early systems were adaptations from shore based installations which were unable to withstand the new environment. It seems that, at the present time, a major controversy exists as to whether electronic or pneumatic control systems fare the best. Whatever the answer, though, the common thread is still to simplify. It is very frustrating that few people are applying the advice.

Maintaining and Supporting. This area, along with reduced manning, is,as far as costs go, the major difference between the new and the conventional ship. The complex trade-offs involving the extent and type of automation, the functions of the ship (i.e. mission requirements), numbers and levels of available personnel, requirements

of trade unions, international maritime laws and the requirements of the classifying Societies (i.e. American Bureau of Shipping), have muddied the relationship between the initial costs of automation and the potential benefits. B.C. Tonkin, Superintendent, Buries Markes Ltd., London writes, "Situations can develop where costly automated plant has been installed only to find it necessary to augment the number of engineers to keep up maintenance. Furthermore, in ships with little time in port, maintenance costs appear to be higher due to additional employment of shore labour to keep abreast of maintenance."[9]

Th. Van Halderen, Superintendent Engineer, Koninklijke Nedlloyd N.V., Rotterdam, Holland describes his company's experiences in this manner, "Automation and reduced manning has not led to more work to be done by shorebased repairers. On ships with unattended engine-rooms, for instance, more men are available for maintenance during the day. We have not encountered many problems in maintenance of automated systems; however, one must be assured of well trained engineers with a good knowledge of automation."[10] The phrase, "well trained engineers

with a good knowledge of automation," will be discussed later..

Experiences with manned, but automated, plants indicate that maintenance of the automated system quickly deteriorates, because the crew becomes confident that they can use the manual override system to perform all of the control functions. The lesson here is that if you are going to automate keep the crew out of the spaces.

In addition to the ever present argument of modular or piece-part repair at the organizational level, shipbuilders are arguing with suppliers over parts standardization. The remarks of R.J. George, Marine Market Manager, Drayton Controls Ltd., Middlesex, England illustrate some of the successes in maintainability which seem to pervade the literature, " Our method of standardized construction has brought savings both in first cost of the installation and of capital tied up in spares. An analysis of the cost of 100 installations extending over a period of five years gives the following results:

> Costs of spares: 0.3 per cent per annum, of original cost of installation.
> Cost of service: 0.3 per cent per annum, of original cost of installation (this includes original commissioning).

In over 80 percent of the installations under

consideration, the spares originally supplied are unused and commissioning is the only service which has been required."[11]

Maintaining and supporting must be extended to encompass members of the crew. Manning reductions have led to curtailment of medical facilities. The problem of maintaining the physical state of the crew has led to many ingenious solutions. The following quote was taken from a description of the OHTSUKAWA MARU, an experimental computerized ship; "The medical diagnosis programme is designed to assist in taking proper action and providing the correct care, in the case of a crew member who has been taken ill during a voyage, where there is no doctor on the ship. A list of questions, the answers of which are either "yes", "no", or "unknown", regarding a patient's symptoms are kept on the ship and these answers supplied by the sick crew member are fed into the computer. Data is fed in by operating the ten-key input on the cargo operating console in the cargo control room.
This programme consists of diagnosis for internal treatment and surgery. However, the surgery information is restricted to external wounds only and the

diagnosis supplied by the computer shows the extent of the emergency, and the name of the disease-the treatment required being typed out in a predetermined code number. Accordingly, a list of disease numbers and the corresponding treatment number is supplied to the ship."[12]

Training. All claims concerning marked improvements in reliability and maintainability have been, in some way, followed by discussion of the abilities of the ship's officers and crew. Training of crews is often a double-edged sword. The superficially trained engineer has done much damage when confronted with a persistent maintenance problem. On the other hand, Kern and Williams, describing Salen's experiences with the first crew of the T/T SEA SOVEREIGN, an older sister to the T/T SEA SERPENT, noted that most of the crew left for more lucrative and stable land based jobs. Follow on crews received several hours instruction about the computer. Additional learning, if any, was gained on the job. The Captain was the only man to update or reload programs. Corrective action to repair the computer must be deferred until port is reached. There have been only 3 problems during the 18 month old ship's

life; all in the first 5 months of operation. Two were programming errors and one was a cracked circuit board. The engineers were somewhat upset that they were not sufficiently trained, but they were very confident concerning the reliability of the computer.

An interesting comment was presented by Mr. T. Kameen, Engineering Director of Cunard International Technical Services.[13] He felt that, although each supplier provided excellent training courses, no training facilities were provided to train crews in all facets of ship's machinery.. The reduction of crew sizes, however, forces individuals to be capable of performing many functions. The day of the specialist seems to be disappearing.

Social Problems. This topic can best be handled by summarizing an article written by D.H. Moreby, Senior Lecturer in Ship Management, Plymouth Polytechnic and Associate, Human Resources Center, Tavistock Institute.[14] Moreby reports the emergence of interdepartmental flexibility. Shipowners have limited this melding of functions to the deck and engine department crews. Some ships are operating, however, with General Purpose

Ratings, which blend deck, engine and catering department crews. These actions have caused speculation as to the effects of similar actions among the more highly trained and specialized engineering officers..

Many people predicted the demise of the Radio Officer in the British fleet, but, the union changed its name to the Radio and Electronics Officers' Union. It went on to insist that radiomen continue to serve as electronics officers. This has, also, caused some consternation among engineering officers.

Relationships have changed between the officers and crew to the point where the distance separating them has become very small. Many good officers have faltered in this more informal organization. Officers insufficiently prepared for the increased technical complexity have, also, fallen in esteem.

Pay increases have begun to lure the more liberated women to the sea. Moreby speculates that the high pay will attract intelligent girls who will outdistance their less educated male co-workers.

Moreby's major point is, that unlike the changes which took place when engines replaced sails,

today's changes are more rapid and are forcing the industry to make quick adaptations. He advocates a total system approach to manning and training. Moreby postulates that the ships society will be affected when any of the following variables are disturbed; the technical system, legal requirements, ships' organization, training, recruitment, methods of ship operation, career prospects, union and professional organizations and society as a whole.

In summary, although many of the effects produced by automation have had a negative impact on the greatly reduced crews, it is interesting to note that the Bridge Watch Officers aboard the T/T SEA SERPENT were impatiently awaiting the arrival of a fully automated bridge, so that they could enjoy the same working hours as their companions in the engine room. Since they are looking downstream, it would seem apropos to turn our attention in the same direction.

THE FUTURE

Much of the available material, dealing with the shipbuilders/shipowners' past experiences, has also, been devoted to extapolations for the 1980's. Late in my research phase, I received a copy of a report[15], prepared by a group within the Swedish Shipbuilders' Association, which incorporates all the predictions I was able to uncover. The report was compiled by a specially formed steering group from the Associations' Technical Committee. The steering group funded a series of sub-projects, each dealing with a different aspect of ships and their crews, and interviewed people in Europe, the United States and Japan; all in a period of 18 months. The report summarizes the findings of the sub-projects, as well as the developing trends observed during the group's travels. The following paragraphs will attempt to summarize the more notable portions of the steering group's work.

<u>The Seaman on Board</u>. This section of the report complemented the observations of D.H. Moreby which were discussed earlier. The steering group

predicted that well developed relief systems will have to be developed to attract and retain competent crews. Technological advances will demand the enlistment of highly trained people and these people will demand more participation in the ships' organization. Living conditions must be improved to rival the material and cultural conditions ashore. Programs will have to be developed to provide meaningful leisure time activities.

The Japanese are making some physical changes to increase harmony among their crews. Large rooms are being incorporated in the ships to provide meeting places for social activities. Cabin furnishings are detachable so that each occupant can personalize his quarters.

The Europeans have recognized that boring work cannot be offset by increased leisure time. Some owners have formed senior officers into management teams and have encouraged the crews to participate in the preparaton of department budgets. Efforts have been made to enhance the social status of seafarers through press articles and contact with schools.

Training. Here, the steering group called for

a restructuring of the conventional training courses to make them mesh with the educational pattern of the community at large. It felt that recruitment would be easier if people believed that the qualifications gained in seafarers schools could be transferred to other educational patterns without damage to their educational advancement. The aim in the planning of seafarers courses would be to create a favorable attitude toward the job and the individual's personal development.

Unfortunately, the steering group was unable to uncover much progress along these lines. They found, instead, that schools were concentrating on the acquisition of large and complex training simulators. The Kings Point Merchant Marine Academy, in New York, reported some progress. It has been training general service officers for several years. The course of instruction is an amalgam of deck officer and engineering officer training.

Communications. The steering group pointed out that the ship-to-shore link has been unable to alter the fact that a ship at sea is a sealed entity. They were of the opinion that the basic

problem was not technical inasmuch as satellite and automatic telecommunications technologies are well advanced fields of engineering. Rather, the impediment to the advancement of communications was the lack of international coordination. The complexity of modern ships combined with the limitations of their crews seemed to demand rapid communications between ships, shipowners and shipbuilders. The steering group noted increased activity in satellite communications systems in both the United States and Japan.

Maintenance. The steering group reported that the trend was toward heavy investment in improved component reliability with subsequent removal of maintainance functions from the ship. Interestingly enough, the steering group proposed a concept, much like the U.S. Navy's Integrated Logistics Support Concept, whereby support planning would begin during the early stages of development and be tailored to the mission of the ship. They foresaw the continuation of the problems associated with determining the cost benefits of various maintenance schemes and proposed a cooperative effort among shipowners to build a data base from operational

experience.

The report covered other areas in addition to the aforementioned, however the portions summarized here were most pertinent and did not violate this author's promise to avoid engaging in excessive technical detail. It should be noted, at this point, that the problems beseiging the commercial maritime community do not differ from the problems associated with the world's technological revolution. It would seem incumbent upon the shipbuilders to eliminate the tendency to in-breed and to turn to the community at large for help.

The problems that a navy must face are a bit more complex. Automated fighting ships with reduced crews must be able to transit from port to port and maintain the capability to engage in tactical actions. The numbers and complexity of advanced weapon systems aboard a single ship add new dimensions to the problem.

It is, therefore, logical to examine the ongoing and planned actions of, in this case, the U.S. Navy, in light of commercial experience, to evaluate their sufficiency. The rest of this article will be devoted to a discussion of the

Navy's recent efforts to coordinate reduction in shipboard manning. It should be realized that, in an organization as large as the U.S. Navy, there are many groups working on any one subject and that any attempt to summarize efforts runs the risk of slighting one or more groups of people. I would like to offer my advance apologies at this time.

REDUCED MANNING IN THE U.S. NAVY

The CNO's Action Sheet, mentioned in the introduction, had the effect of marshalling a number of parallel efforts which had been at work in the Navy for some time. A subsequent Action Sheet, No. 333-72, specified a goal of 5 men for a normal bridge watch; 1 officer, 1 helmsman, 1 signalman, 1 lookout and 1 quartermaster. Replies to both action sheets pointed out that a full scale mock-up, built around off-the-shelf technology, had been available at the Naval Ship Research and Development Center, Annapolis, Md. (NSRDC) since 1966. It had been designed to reduce bridge manning to 2 people.

The Bureau of Naval Personnel had been planning to validate the manning proposed for the new Patrol Frigate (PF) in at sea tests aboard a DE 1052 class ship. The PF design was the Navy's first major effort in manning reduction. The validation program was to accomplish the reductions, without equipment augmentation, by varying the number of men, the ship's organization and the work assignments. Results of the research will be

factored into the detailed design effort.

Meanwhile, automation of many shipboard systems had been progressing. Automated steam plants had found their way onto several non-combatant ships. So had remote fire fighting systems and remote unmanned damage control sensors. Efforts were being made to develop equipments with self diagnostic capabilities. Manning investigations had been conducted aboard the DLG-23 and the USS GUAM. The CVAN-68, had been analyzed to reduce manpower requirements. Habitability had gained emphasis in the naval community.

Unfortunately, these efforts had not had high level coordination. The CNO established an OPNAV Coordinator for Shipboard Manning Reduction in June, 1972.

In September, 1972 a Joint Fleet/Laboratory Team was established to investigate bridge manning reductions and to establish and evaluate opp-ortunities for personnel reductions in other areas of ships. The bridge manning reduction require-ment was thought to be least disruptive to im-plement and was, therefore, accorded the highest

priority.

A two-phase pilot program was conceived to coordinate the efforts of NSRDC, the Destroyer Development Group (DESDEVGRU), the Naval Personnel Research and Development Center (NPRDC), and 16 Fleet units, which were to act as research platforms; 2 carriers, 2 service ships, 2 amphibians and 2 squadrons of destroyers.

The first phase involved an investigation of the ship's organization and administration to reduce manning without using new equipments. Through the liaison efforts of DESDEVGRU, laboratory personnel were able to visit the Fleet units and members of the fleet were able to come ashore to be familiarized with on-going programs. The lab people were able to use time/motion analysis, both at sea and in NSRDC'S full scale mock-up, to identify duplication of effort and areas which could be augmented by equipment to reduce workload.

The fleet units were requested to establish watch teams manned by experienced personnel in an effort to develop cross-training and a high level of esprit. They were asked to examine their

internal organizations and to reduce the administrative workload on bridge personnel.

The laboratory teams observed the practice of assigning 11 to 13 enlisted men under the control of an Officer of the Deck and a Junior Officer of the Deck to man the ship control watch. The majority of the men are Facilities Maintenance men who, in addition to their normal function, stand 56 hours of watch out of a 74 hour workweek and yet advancement in rate is not primarily associated with the watch function.[16] The Laboratories proposed a Ship Controlman Rating and developed a formal plan with a training package.

The laboratories, also, proposed to eliminate duplication of effort between the Combat Information Center and the bridge by allowing the CIC to assume the tactical decision responsibility and the bridge to confine its functions to maneuvering and navigation. The Fleet, however, was not in all cases ready to accept this.[17]

Efforts in the first phase of the Pilot Program resulted in the reduction of bridge crews in all of the units except carriers. The lack of success with the carriers was due to the fact that

they spend most of their time at high operational states of readiness. In general, the remainder of the Fleet units were able to operate close to the CNO goal but usually insisted upon manning After Look-out and After Steering. The Destroyer Escort bridge was reduced from 13 men to 7 with an approximate savings of $100,000 per year, per ship.[18]

The second phase of the program concentrated on using off-the-shelf equipments to reduce manpower requirements. Some of the equipments selected for evaluation were as follows;

a. auto pilots

b. collision avoidance devices

c. voice actuated recorders to tape radio telephone messages for playback

d. Infra red laser hand held communicators with 2½ mile range for ship-to-ship communications.

Although the final results of the Pilot Program have not been assimilated, preliminary results seem quite encouraging. Despite a natural resistance to manpower reductions, the Fleet units displayed enthusiasm by making many

suggestions of their own. Most of the equipments have reduced workload and eliminated excess functions. Hewever, efforts have only begun.

Within the next two years, a DE 1052 class ship will be equipped with a totally integrated bridge system and a totally automated plant. Two other demonstration type destroyers will be used to evaluate a number of concepts. For example, Facilities Maintenance, which required a great number of personnel, will be performed by contracted or tender crews during 2-3 day availabilities. Administrative functions will, for the most part, be moved ashore. Office spaces will be consolidated. Provisions will be made for catered food in port, disposable mess gear, pre-packaged meals, disposable uniforms, and the use of in port laundry services. Maintenance teams will perform preventive and corrective maintenance with no watch standing responsibilities.

The laboratories are actively soliciting suggestions. The basic criteria for evaluation are manning reduction potential, impact of implementation, costs and feasibility. The Ship-

board Manning and Automation Project Officer (NSRDC Code 2792) will put together a recommended implementation list.

LCDR Fulton of Naval Ship Systems Command, Code 03Z, is looking at plans for the 1980's. One of his tasks is to reduce the complements for future destroyers from 200 to 12 men, using off-the-shelf or low risk technology. He believes that success will be determined by changes to the basic design approach. Ships and equipment must be designed to meet the capabilities of the reduced crews rather than let the size and complexity of the ship determine the size of the crew.

During our discussions, he handed me a lengthy list of problems which he anticipated. I would like to summarize some of them here.

a. Automation of refueling/rearming procedures, damage control, firefighting, ship control and the food service system

b. Remote monitoring of spaces

c. Combined sensor display in the bridge/CIC for weapons systems, equipment test and checkout system, radars, sonars, etc.

d. Replacement of lookouts with TV monitors

e. Placement of battle stations to spread crew throughout ship

f. Automation of spare parts and supplies (inventory, issue and reorder)

g. Organization of tender and shore based support

h. Provision for short notice replacement for ill/absent crew members.

i. Reduction of maintenance man-hours by an order of magnitude.

j. Identification/resolution of problems concerning international law

k. Cross-training of crew

Some of these problems are formidable. Hopefully, the short term programs will provide some meaningful guidance. Suggestions will, also, come from on-going discussions with the Maritime Administration, the Merchant Marine Academies and commercial shipbuilders/shipowners, both foreign and domestic.

SUMMATION

The U.S. Navy's manning reduction program may be in its fledgling stages, but the plans being laid seem to be well thought out. My conversations with some of the participants leads me to the conclusion that they are aware of the progress made in the commercial world. Anticipated problems are being carefully analyzed. Innovative solutions are being actively solicited. Papers discussing the subject, much like this one, are being written to advertise the program.

But, what has the CNO's decision to appoint an OPNAV Coordinator really accomplished? Can you imagine the reaction of the commercial world when it sees the first new automated naval ship in the late 1980's? Will we have re-invented the wheel? Can we survive ten years of decreasing resources (dollars and manpower) before we begin to see the relief of reduced manning? We must realize that it is going to cost more to build that automated ship, because, for the first time, manpower will be being replaced by expensive hardware systems. Will the procurement dollar

be able to stand the strain in the 1980's.

It is interesting to note that the 2 man bridge mock-up at the laboratory in Annapolis has been in existence since 1966, yet the PF and the Sea Control Ship have not elected to use it.

I cannot see the need for dramatic technological breakthroughs. The short range program, as currently conceived, will take several years to automate a bridge and an engine room on one ship. The program will undoubtedly run into many problems, because we will be designing a system of controls for existing plants; contrary to the lesson learned in commercial shipbuilding. Do we need to determine the feasibility of automating marine plants and bridges? Will the cost data gained be applicable to other situations? I don't think so.

The whole program, both short and long range, presupposes, and rightfully so, resistance from the fleet. However, can a low key, slow moving program spark the imagination and sell the fleet? Quite unlikely. What the program needs is a firm position at the top levels of the hierarchy, much like the Surface Effects Ship enjoys. The Navy must start planning for the construction of a

demonstration ship now so that it will be in the water before 1980.

It would seem that such a program would be a natural candidate for NATO participation. There is a huge reserve of knowledge stored among our European allies. We share the common problem of reduced resources, especially manpower.

First, we must convince Congress that we can slash O&M costs by increasing our investment costs. Here, again, international cooperation could be used to research the data banks of foreign shipbuilders to determine the last decade's operating costs. I am somewhat amazed that Congress, realizing the soaring manpower costs, has not pressured the Navy to automate years ago. It may be due to the fact that our marine industry has lagged far behind our competitors for so long.

We must decide on the size and composition of the crew. With this information we can take the additional constraints of cost, time and performance and design the demonstration ship. Since we will have chosen to design the ship around the crew, we should bring into play the large body of knowledge we have amassed in the behavioral

sciences. We have ignored this area of research for too long. The success of a demonstration ship will depend heavily upon the motivation of the crew, and the success of our efforts to reduce manning will rest on the success of the demonstration ship. We cannot afford to fall into the lure of sophisticated gadgetry.

Concurrent with the ship design, we must design a pilot support system. To reduce dependence upon a large shore based military establishment we should investigate the contracting out of many of the support functions. In this ship, unlike many of the others we have built, Integrated Logistics Support must be more than a catchy phrase. It is, also, interesting to note that we will not have to pay retirement benefits to contractor personnel when we cease to require their services. This would be a significant cost savings.

With the cooperation of our allies, technically and financially, and a great deal of off-the-shelf-technology, such a program would yield many benefits. It would show the Congress and the American people that the Navy is seriously

trying to reduce costs. The program would serve as a visible focal point for the generation of new ideas. Subsequent ship development efforts would benefit from experiences gained from the demonstration ship program and be psychologically influenced by the high level attention to manpower reduction. Retrofit actions on other classes of ships would meet less resistance. Legal and social barriers would be met by a unified force.

The time to act is now, tomorrow will be too late.

BIBLIOGRAPHY

1. Bureau of Naval Personnel publication NAVPERS 15163, "Navy Military Manpower Billet Cost Data for Life Cycle Planning Purpose", Navy Dept., Washington, D.C., April 1972
2. "The Naval Engineer and Shipboard Manpower Utilization", Artis I. Plato, presented at the ASNE Symposium, 28 Sept. 1973
3. "CNO Pilot Program for Reduced Bridge Manning", LCDR J. Dachos, presented at the ASNE Symposium, 28 Sept.1973
4. CNO ltr Ser 1950 P09 of 15 June 1972
5. "Some Reports on the State-of-the-art in Automation of Modern Merchant Shipping, Vols I and II", D.H. Kern and T.J. Williams, Purdue Laboratory for Applied Industrial Control, Contract No. N00024-73-C-5483 with Naval Ship Systems Command, 15 August 1973
6. Motor Ship, March, 1971 p. 561
7. Ibid, p. 562
8. Ibid, p. 561
9. Ibid, p. 562
10. Motor Ship, March 1972, p. 554

11. Ibid

12. Motor Ship, March 1973, P. 557

13. Shipbuilding and Shipping Record, 17 April, 1970, p. 37

14. "The Complexity of Change in Ship's Manning Systems", D.H. Moreby, Marine Engineers Review, February, 1971, pp. 13-17

15. "Manning of Technically Advanced Ships of the Future", edited by Per-Olav Bjurstrom, Swedish Shipbuilders' Association, Sept. 1972

16. "Manpower Reduction: A monetary necessity or a catalyst for improving military systems?" by P. Edmondo, NSRDC (ANNA), (unpublished)

17. LCDR J. Dachos, p. 3

18. NSRDC R&D Planning Summary of May 1973